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Collective dynamics during cell division STEFANO ZAPPERI, University of Milan, ZSOLT BERTALAN, ZOE BUDRIKIS, ISI Foundation, CATERINA A. M. LA PORTA, University of Milan — In order to correctly divide, cells have to move all their chromosomes at the center, a process known as congression. This task is performed by the combined action of molecular motors and randomly growing and shrinking microtubules. Chromosomes are captured by growing microtubules and transported by motors using the same microtubules as tracks[1]. Coherent motion occurs as a result of a large collection of random and deterministic dynamical events. Understanding this process is important since a failure in chromosome segregation can lead to chromosomal instability one of the hallmarks of cancer. We describe this complex process in a three dimensional computational model involving thousands of microtubules. The results show that coherent and robust chromosome congression can only happen if the total number of microtubules is neither too small, nor too large. Our results allow for a coherent interpretation a variety of biological factors already associated in the past with chromosomal instability and related pathological conditions[2].

[1]Z. Bertalan et al. Navigation Strategies of Motor Proteins on Decorated Tracks PLoS One 10 e0136945 (2015)
[2]Z. Bertalan et al. Role of the Number of Microtubules in Chromosome Segregation during Cell Divison, PLoS One, 10 e0141305 (2015)

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